

Global Precipitation Measurement Mission

From Satellites to Your Backyard



Did you know that NASA has satellites that are able to observe rain and snow all over the world? By following some easy directions, you can access NASA data to see how much precipitation was observed by satellites for your location any time from June 2000 to the present time!

NASA's [Global Precipitation Measurement \(GPM\) mission](#) is an international satellite mission in collaboration with the Japan Aerospace Exploration Agency (JAXA) that uses multiple satellites orbiting Earth to collect rain, snow and other precipitation data worldwide every thirty minutes. The GPM Core Observatory was launched from Japan in 2014. GPM is a follow up mission to the [Tropical Rainfall Measurement Mission](#) (TRMM), which launched in 1998. Thus, we have a detailed dataset of global precipitation observations that span almost two decades. These observations are available for most of the world.

In this activity, you will be guided to download monthly [IMERG](#) liquid accumulation equivalents which you can use to see how much precipitation was observed for your location. As the spatial resolution (the area covered by each data point) for IMERG data is an approximately 10-kilometer/~6 mile square region, the amount of precipitation that you will see from the data you get may differ from exactly how much fell at your specific location. It is pretty amazing, but true that it can rain heavily on one block, while right down the street the ground is still dry. Inaccuracies in processing the satellite observations can cause differences as well.

We will be collecting monthly precipitation data for this activity using the *Giovanni* tool. At the current time, these data are available from June 2000 to nearly the present time. This data product has a 3-month latency, which means it takes about 3 months from the time the data is collected to it being processed and made available for download. There are also IMERG datasets available with a much faster latency, and you can see how to access that data [here](#).

[Giovanni](#) is a powerful web application for viewing, analyzing, and downloading multiple Earth science data sets. It is a free website, and it is a good idea to create a user account, as it allows you to visualize larger datasets. Be sure to register for

Global Precipitation Measurement Mission

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your free Earthdata account so you can access and save this data. You will be prompted to register the first time you open Giovanni.

Getting the GPM data

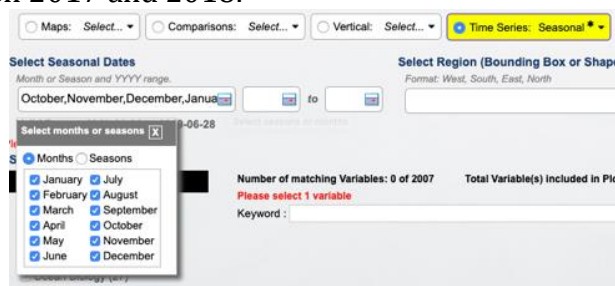
The data from the GPM mission comes in many formats, depending on what the end-user (in this case, you!) is doing with the data. For this activity, you will be working with the Integrated Multi-satellite Retrievals for GPM (IMERG) data.

To see an animation showing the last week of IMERG data, click [here](#).

1. To begin, click [here](#) to open the Giovanni tool (Login if needed - Remember that it is useful to register for the free account as that will enable you to view data over a period of longer than 4 years and to download and save the data).



2. At the top of the page, under the "Select Plot" option, click on "Time Series"
3. Scroll down and click on "Seasonal" under the options.
4. Go into the "Select Seasonal Dates" and this will open a smaller box with months that you can click. For this example, I clicked on all of the all of the months, as I am interested in seeing how the precipitation in my location varied between 2017 and 2018.



5. Next, select the years that you want the data to cover. You may need to type in the years by hand as this particular box area can jump around. Remember that the IMERG data we are working with in this activity range from June 2000 through the present time. (There is a 3 month "lag" in this level of data,

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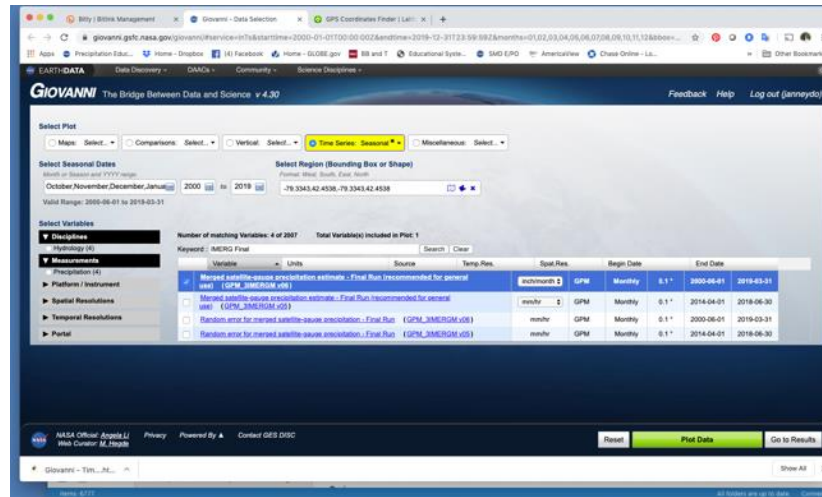
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which means you will only get data up to about 3 months from today.) For this example, I put in 2017 and 2018, as I only wanted to compare the precipitation amounts per month for this year.

- You will select the location that you want observations to cover. In the "Select Region" box, you must put the longitude first and put a comma, and then add the latitude. This program uses decimal coordinates. You can find the longitude and latitude of any location [here](#). Be sure to use the DD (decimal degrees) **and input the longitude first, and then add a comma, and enter the latitude** (note – these values are the reverse of the order that is shown on the Geolocation site). After you input the coordinates in the "Select Region" box, it will then repeat these values to show you are selecting just one specific location (Giovanni also lets you measure across larger regions defined by a "bounding box"). Please remember that precipitation is quite variable and each IMERG data point covers a ~10km square region.

For this example, I will use Fredonia, NY. The decimal longitude and latitude data will look like this "-79.3343, 42.4538" (You only need to add four digits after the decimal point for this data).

- In the box that says in red "Please select 1 variable"- place "IMERG Final" in the "Keyword" box and press "Search".



Variable	Units	Source	Temp. Res.	Spat. Res.	Begin Date	End Date
Merged satellite-gauge precipitation estimate - Final Run (recommended for general use) (GPM_3IMERGM_v6)	inch/month	GPM	Monthly	0.1°	2000-06-01	2019-03-31
Merged satellite-gauge precipitation estimate - Final Run (recommended for general use) (GPM_3IMERGM_v6)	mm/month	GPM	Monthly	0.1°	2000-06-01	2019-03-31
Random error for merged satellite-gauge precipitation - Final Run (GPM_3IMERGM_v6)	mm/month	GPM	Monthly	0.1°	2000-06-01	2019-03-31
Random error for merged satellite-gauge precipitation - Final Run (GPM_3IMERGM_v6)	mm/month	GPM	Monthly	0.1°	2000-06-01	2019-03-31

- Another box will open up below this box that has several options. Click on "Merged satellite-gauge precipitation estimate- Final Run (GPM_3IMERGM_v6)" and be sure to go to the box that says "units" and select either "inch/month" or "mm/month" based on your preference.

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Number of matching Variables: 4 of 2007

Total Variable(s) included in Plot: 1

Keyword : IMERG Final

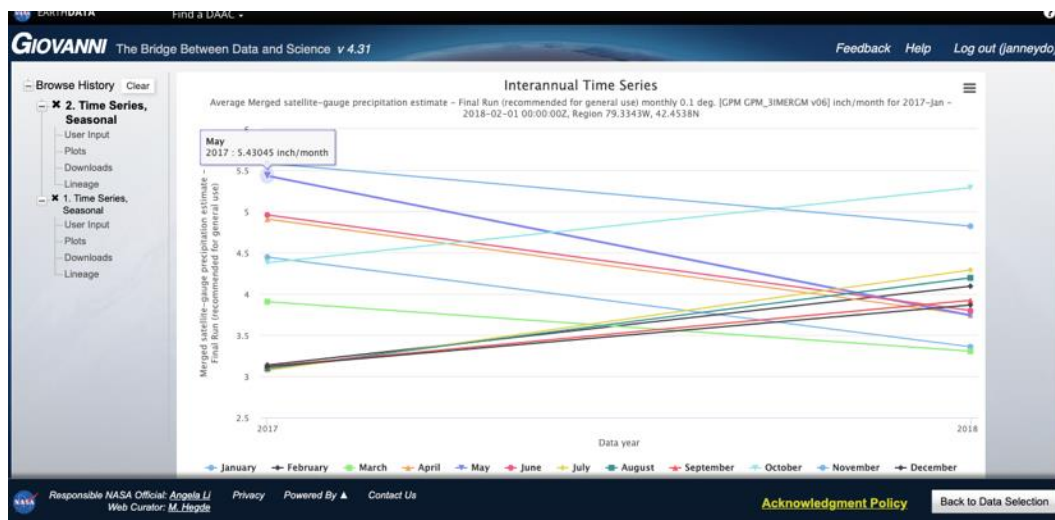
Search Clear

Variable	Units
<input checked="" type="checkbox"/> Merged satellite-gauge precipitation estimate - Final Run (recommended for general use) (GPM_3IMERGM v06)	mm/month
<input type="checkbox"/> Random error for merged satellite-gauge precipitation - Final Run (GPM_3IMERGM v06)	mm/hr
<input type="checkbox"/> Random error for merged satellite-gauge precipitation - Final Run (GPM_3IMERGM v05)	mm/hr
<input type="checkbox"/> Merged satellite-gauge precipitation estimate - Final Run (recommended for general use) (GPM_3IMERGM v05)	mm/hr

9. Go down to the bottom right of the screen and click on the green box that says "Plot Data".

10. As you wait for your data request to be processed, you should see a box that says "launching workflow" and other information will come up telling you the status of your request. Note that the data may take a while to download.

If you have done everything correctly, you will now see a line graph with lots of different colored lines. You can save the graph by clicking on the three lines to the right near the top of the box and download the image as well (as long as you have registered with Earthdata).



As you look over this data, you will see that most months have different colored lines. You can see how the amount of precipitation changes over time and compare and contrast the amount of rain between months and over the years. If you hover over a point on the interactive online graph, the exact measurement will be displayed, as seen in the example above for May 2017. You can also view the data in a spreadsheet and see the measurements by year and month by following the directions below.

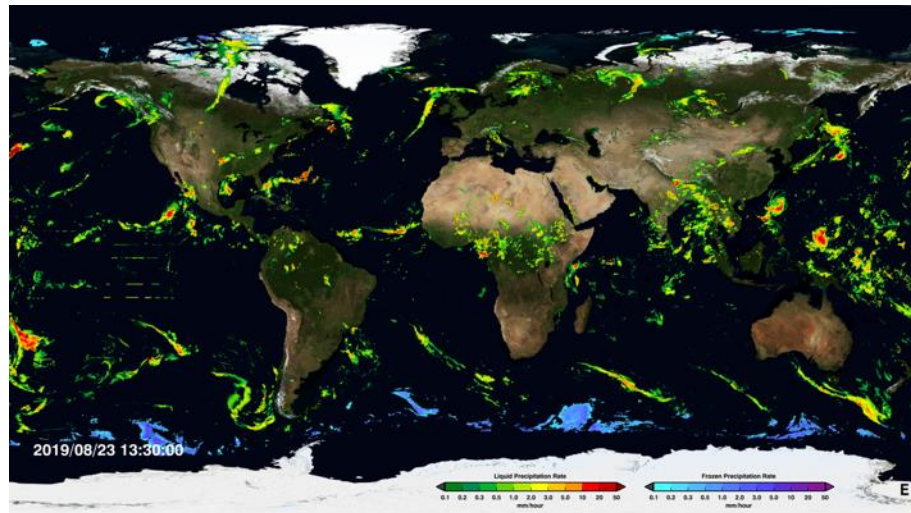


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To save this data into a spreadsheet, click on the far-left menu bar option that says "Downloads" and then select the bottom choice that is titled "Combined ASCII". (Please note that you will need to be logged into your Earthdata account in order to use this feature.) This will download a ".csv" file to your computer, which you can then view using Microsoft Excel or any other spreadsheet software.



GPM's IMERG Fall 2019 Campaign

We are celebrating the fact that we have released our latest version of the IMERG data this fall. If you create a line graph or spreadsheet with the GPM data for your location, please send it to me at dorian.w.jannev@nasa.gov and I will send you a digital certificate of appreciation from the GPM mission.

Additional Resources

In case you want to learn more, here are some great resources:

- Find out how to access TRMM and GPM Precipitation data sets [here](#).
- Watch "[Getting the Big Picture](#)" video (2:39) to learn about the uses and advantages of remote sensing
- Read "[Understanding Earth: What's Up with Precipitation?](#)" to learn how and why NASA satellites observe global precipitation.
- See the wide array of education and outreach resources on the "[Precipitation Education](#)" website.
- Watch "[The Data Downpour](#)" video (4:17) to learn how IMERG data is gathered and processed.